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ABSTRACT

This report discusses advances in computer-based technologies that can be used for teaching limited English proficient (LEP) minority students. These technologies offer multisensory delivery, increased self-expression and active student learning, cooperative learning, communication skill practice, multicultural education, and enhanced motivation. The most promising technologies are described, such as CD-ROM, authoring programs, interactive videodisc, digital audio, local area network computer links, and telecommunications. These technologies can be used for instructional testing and assessment; to teach culture; to help students learn academic content and develop critical learning skills; and to expand students' speaking, listening, reading, and writing skills. Specific examples are given for speaking, listening, reading, writing, culture, and testing. Barriers to implementing these technologies are briefly discussed. Two computer programs are recommended and detailed: Computer Education for Language Learning (CELL) and Alaska Writing Program (AWP). (Contains 20 references.) (NAV)

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Directions
IN LANGUAGE & EDUCATION

Vol. 1, No. 1, Winter 1994

AN INTRODUCTION TO EDUCATIONAL TECHNOLOGY

by Matthew Soska

What is educational technology?

Not too long ago, when we said educational technology we were referring to radio, television, film strips, overhead projectors, tape recorders and videocassette recorders (VCRs). Educational technology has advanced rapidly during the last few decades. Today, when we say educational technology we are referring largely to a vast array of computer-based technologies such as compact disc-read only memory (CD-ROM), interactive audio, interactive videodisc, local area networks, hypermedia, and telecommunications.

What does the research say about educational technology?

The technologies covered in this synthesis are diverse, and it is difficult to generalize the research findings. In addition, many of the technologies are extremely new and have not been fully analyzed. Until now, the majority of research into technology in education has focused on computer-based education (CBE). Many reviews and summaries of these studies have been reported in recent years (Kulik & Kulik, 1986; Niemiec & Walberg, 1987; Fletcher, 1990). The findings of these studies generally report a moderate positive effect on student achievement and a substantial reduction in instructional time over traditional methods of instruction. However, the outcomes of the research are influenced by many factors and have not been consistent across grade levels or content areas (Barron & Orwig, 1993).

Research efforts are now under way to investigate the effectiveness and efficiency of a broader range of computer-based instruction—that of multimedia and telecommunications. "Multimedia instruction" can be loosely defined as technology integrating some, but not necessarily all, of the following in an interactive environment: text, graphics, animation, sound, and video. The complexity of such applications complicates the research process; however, the following observations can be made based on the attributes of the technologies.

Multisensory delivery: Research indicates that some students learn better through different modalities, such as audio, visual, or kinesthetic (Barbe & Swassing, 1979; Carbo, 1988).

Increased self-expression and active learning by students: New technologies provide stimulating environments for students to become active in the learning process. A long-term study sponsored by Apple Computer revealed that students had a "higher degree of social awareness and self-confidence; they [were] more independent and [had] more positive attitudes about learning and themselves; they [were] able to experiment and problem solve with greater ease..." (Apple Computer, 1991).

Cooperative learning: Technology provides many opportunities for students to work collaboratively. Research supports the use of group interactions to increase instructional effectiveness and efficiency, as well as positive social interactions (Johnson, Johnson & Stanne, 1986; Schlechter, 1990).

Communication skills: Communication skills can be enhanced by utilizing technology in small groups and through the use of telecommunications (Steinberg, 1992).

Multicultural education: Technology can help students gain a greater understanding of different cultures by linking students from different parts of the world (Salomon, 1991).

Motivation: Student interest and motivation are constant challenges in education. Technology can inspire students by making learning exciting and relevant (Perry, 1984). The fact that students enjoy working with technology and therefore stay on tasks for longer periods of time could be a valuable long-term benefit (Summers, 1990-91).

What are the most promising technologies for LEP students?

The computer serves as the core of today's educational technology. The computer by itself has many capabilities for enhancing language learning, but when combined with other technologies—such as audio, video, and modems and phone lines—the possibilities are even greater. Following is a brief description of some of the most promising technologies for limited English proficient (LEP)/ language minority students.

Customizing, Template, and Authoring Programs: The greatest flexibility for teachers in educational technology is in the area of authoring programs. Teachers can use these programs to create simple or elaborate software using their own materials. This enables teachers to design the program to fit their own lesson plans and the unique needs of the students. Authoring programs range from simple template programs to more complicated authoring languages. Multimedia capabilities can be employed using this technology.

Compact Disk-Read Only Memory (CD-ROM): CD-ROM technology is rapidly changing the way we store and retrieve information. CD-ROM is closely related to the audio compact disk (audio CD) developed in 1982. Both technologies use a small plastic disk that is 4.72 inches in diameter. The primary difference between audio CD and CD-ROM is that audio CDs are designed to store music only; CD-ROM discs can store a variety of media, such as text, graphics, video, and audio. One of

the best storage features of CD-ROM is its enormous storage capacity, currently more than 650 megabytes. This is equivalent to several hundred floppy diskettes or the entire text of a 20-volume encyclopedia. It is important to note that CD-ROM discs are read-only, that is, the information is permanent and cannot be modified or erased. A laser beam is used to read the disc, which means that there is no contact or wear on the disc when it is used.

CD-ROMs have great potential for enhancing learning for LEP students because they can be used to access software, dictionaries, databases, multimedia products, and interactive books in many languages.

Interactive Videodisc: Most videodiscs are the same size as a 33-rpm record (12 inches in diameter). They are a strong, durable medium for displaying video information. Videodiscs are read by a laser beam; this provides for the ability to randomly search any segment and play it at fast or slow speeds. The sound on a videodisc is stored in two different tracks that can be played separately or together. This feature provides for the potential of having two different languages for the same video content or for having one track for the students and one for the instructor.

Videodisc programs are referred to as Level I, II, and III. The level is determined by the degree of interactivity. Level I and II programs are used without a computer. Level I provides for no interactivity. Level II provides for interactivity through the control panel or remote control of the videodisc player, generally multiple choice questions. Level III interactivity is achieved when you connect a disc player to a computer, and the computer controls the player through a software program. Level III programs provide for more flexibility because a computer program can offer variety, such as branches based on keyboard and other student inputs.

Digital Audio: For many years, computers were restricted to beeps and metallic-sounding notes. Most computers did not have the capability to play audio, because the hardware and software capable of producing and amplifying the necessary sounds were too expensive or not available. The increased use of digital audio is due largely to the availability of large storage devices (such as CD-ROMs and large hard drives) at reasonable prices and the development of compression techniques that greatly reduce the storage requirement for sound.

Digital audio can be used to teach and test active listening skills. Some programs prompt students to listen to a word or phrase spoken aloud, say the word into the computer microphone, and then listen again as the computer plays back their pronunciation.

Local Area Network (LAN): Computers linked together (in a classroom, building, or lab) via cables form a LAN. In a typical LAN, one computer is designated as the file server. This computer contains a large hard disk drive that stores all the programs used on the LAN, and it runs the software that makes the whole thing work.

A LAN makes it possible for all software to be centralized so that a single, multi-user license can be purchased for each piece of software. This simplifies the licensing issue when a large number of copies of a software program is distributed in an organization. When appropriate software is used, the instructor can also track student progress. In addition, certain LAN set-ups permit students and teachers to correspond with each other in real time or conduct collaborative writing activities.

Telecommunications: Telecommunications, the technology of communication by electronic transmission, is being used to establish new connections between students and educators. Transmission can take place using a modem and telecommunications software or by connecting directly to the Internet, an international network of networks linking governmental and educational institutions as well as the military and commercial organizations. The primary benefit of telecommunication is the rapid transfer of information over large distances while removing the barriers of time and place. It can be used to exchange private electronic mail (e-mail) between people in different parts of the country or world. English as a second language (ESL) learners can communicate with individuals who are proficient in English or other languages wherever they are located. Telecommunications also provides the opportunity to access vast collections of educational and cultural information stored in electronic repositories located around the world. Currently, students and teachers can access information as diverse as the NCBE databases, stock quotes, and local weather reports.

What are the implications of educational technology for LEP students?

For many years, teachers used the computer to provide supplemental or additive exercises. In recent years, advances in computer technology have motivated teachers to reassess the computer and consider it an integral part of daily learning. Today, technology gives teachers the capacity to significantly enhance their students' language and cognitive development. They can utilize the technologies briefly described here for instructional testing and assessment; to teach culture; to help students learn academic content and develop critical thinking skills; and to expand students' speaking, listening, reading, and writing skills.

Speaking: Dialogues in an ESL class can be effectively used to develop speaking skills. Use of an interactive audio program allows students to create dialogues and practice them with other students.

Listening: Interactive videodisc and CD-ROM programs can provide excellent listening comprehension activities, given a good listening comprehension guide prepared for the students.

Reading: Reading skills can be developed substantially using computer-assisted instructional programs. These programs can vary in sophistication from word recognition to reading comprehension. Reading skills can be honed using virtually all technology applications.

Writing: Technology-assisted activities such as fill-in-the-blank, multiple-choice, and true/false can help students to write at the word level. Other types of software, such as databases or spreadsheets,

provide students with experience in retrieving information and developing problem-solving skills. Word processors are ideal for composition or free writing practice at the course level. Some word processors are bilingual and provide online assistance with dictionaries, checkers, and grammar helps. When technology is used interactively among students (through a LAN or telecommunications), cooperative writing activities are strong motivators to help students develop writing skills.

Culture: Because of the visual component, video-based activities are well-suited for observing cultural differences and similarities in a live context. Telecommunications, interactive videodisc and CD-ROM programs provide ways of developing cultural awareness and sensitivity.

Testing: Computer-assisted testing now provides a more comprehensive and accurate way of testing student language and cognitive skills. Students can also self-test using computer-assisted instruction. Teachers can use testing in an instructional mode given the right kinds of activities and programs.

With technology-assisted instruction, there are changes in the roles of both the student and the teacher. Students are given more responsibility for their own learning, while the educator serves as a guide and resource expert who circulates among students, working individually or in small groups with a technology-assisted lesson. Educators observe more of the learning process in action and serve as a guide in that process (Willetts, 1992).

What are the major barriers to implementing new technology?

Many barriers to integrating technology into today's classroom exist. Two of the most prominent barriers are the cost of hardware and software and the availability of training for teachers. As important as these, though, is the fact that all too often, we teach as we were taught; many schools continue to emphasize the same instructional strategy (lecture) and technique (chalkboard) as schools of the 1920s (Barron & Orwig, 1993). The result is that children find schools to be much less stimulating than the multisensory world outside of school. Integrating new technologies is not a cure-all, but early indicators attest that it can help to restructure our classrooms with effective tools for developing active learning, information management, open inquiry, and interpretive skills.

What promising programs for LEP students use instructional software?

As discussed, there are many different types of educational technology. To describe promising programs for each technology is not possible because of space considerations. Instead, as an introduction, two software-based instructional programs are discussed below. Other technology applications will be discussed in future syntheses.

Computer Education for Language Learning (CELL): CELL was developed with a Title VII grant in 1983 from the U.S. Department of Education (Office of Bilingual Education and Minority Languages Affairs). It is a diagnostic/prescriptive program developed and designed to improve English reading and language arts skills by the Irvine (CA) Unified School District.

Students with limited English proficiency in grades 1-6 have made significant gains using computers and commercial software selected by CELL (Chandler, 1989). The CELL Program is easily implemented by school site personnel using a modicum of support and training. Appropriate commercial software has been correlated to an English as a second language continuum for use in lessons supervised by a computer lab technician. After the classroom teacher identifies the students' needs, the lab technician prescribes appropriate software. Close coordination of lab activities with classroom instruction is a feature of the program. The program is designed to be used four days per week for thirty minutes per day. For more information, contact Celia Chandler, Coordinator, Irvine Unified School District, 5050 Barranca Parkway, Irvine, CA 92714; (714) 733-9391.

Alaska Writing Program (AWP): The AWP is a nationally-validated exemplary program of the Yukon Koyukuk School District in Fairbanks, Alaska. National dissemination of AWP is sponsored by a Title VII grant from the U.S. Department of Education, Office of Bilingual Education and Minority Languages Affairs.

The program, developed in 1983, is unique because it includes a computer software package developed by a team of teachers working with students over a ten-year period. The program presents an entire writing curriculum for grades 4-13 with lessons in science, social studies, math, and language arts. AWP consists of three components: (1) student software, (2) a three day teacher training program, and (3) a program of technical assistance for teachers. The software package is designed for Macintosh computers and consists of nine modules which help students plan, draft, revise, proofread, and publish stories, reports, letters, newspapers, essays, research papers, and poetry. The instruction is based on the process model and utilizes all the principles of quality writing instruction recommended by the National Council of Teachers of English. For More information, contact Nikki McCurry, Project Director, Alaska Writing Program, Box 80210, Fairbanks, AK 99708; (800) 348-1335.

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